

Owner's Manual

Installation and Operation

No one builds a better fire

MODELS:

NATURAL GAS
CFL-18NG-C
CFL-24NG-C
CFL-30NG-C
ST-CFL-24NG-B

PROPANE
CFL-18LP-C
CFL-24LP-C
CFL-30LP-C
ST-CFL-24LP-B

GAS-FIRED

CUL US

LISTED



CFL-24NG-IPI

CAUTION

DO NOT DISCARD THIS MANUAL

 Important operating and maintenance instructions included.

CFL-24LP-IPI

- Read, understand and follow these instructions for safe installation and operation.
- Leave this manual with party responsible for use and operation.



▲ WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury, or death.

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- What to do if you smell gas
 - Do not try to light any appliance.
 - Do not touch any electrical switch. Do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

In the Commonwealth of Massachusetts:

- Installation must be performed by a licensed plumber or gas fitter.
- The chimney flue damper, when used with gas logs, will be welded open or completely removed.
- A CO detector shall be installed in the room where the appliance is installed.

A WARNING

HOT SURFACES!

Glass and other surfaces are hot during operation AND cool down.

Hot glass will cause burns.

- · Do not touch glass until it is cooled
- · NEVER allow children to touch glass
- · Keep children away
- CAREFULLY SUPERVISE children in same room as fireplace.
- · Alert children and adults to hazards of high temperatures.

High temperatures may ignite clothing or other flammable materials.

 Keep clothing, furniture, draperies and other flammable materials away.

This appliance has been supplied with an integral barrier to prevent direct contact with the fixed glass panel. DO NOT operate the appliance with the barrier removed.

Contact your dealer or Hearth & Home Technologies if the barrier is not present or help is needed to properly install one.



Installation and service of this appliance should be performed by qualified personnel. Hearth & Home Technologies suggests NFI certified or factory trained professionals, or technicians supervised by an NFI certified professional.

Read this manual before installing or operating this appliance.

Please retain this owner's manual for future reference.

Congratulations

Congratulations on selecting a Heat & Glo gas appliance—an elegant and clean alternative to wood burning appliances. The Heat & Glo gas appliance you have selected is designed to provide the utmost in safety, reliability, and efficiency.

As the owner of a new appliance, you'll want to read and carefully follow all of the instructions contained in this *Owner's Manual*. Pay special attention to all Cautions and Warnings.

This *Owner's Manual* should be retained for future reference. We suggest that you keep it with your other important documents and product manuals.

The information contained in this *Owner's Manual*, unless noted otherwise, applies to all models and gas control systems.

Your new Heat & Glo gas appliance will give you years of durable use and trouble-free enjoyment. Welcome to the Heat & Glo family of appliance products!

Homeowner Reference Information	We recommend that you record the following pertinent information about your appliance.
Model Name:	Date purchased/installed:
Serial Number:	Location on appliance:
Dealership purchased from:	Dealer Phone:
Notes:	

Listing Label Information/Location

The model information regarding your specific appliance can be found on the rating plate usually located in the control area of the appliance.

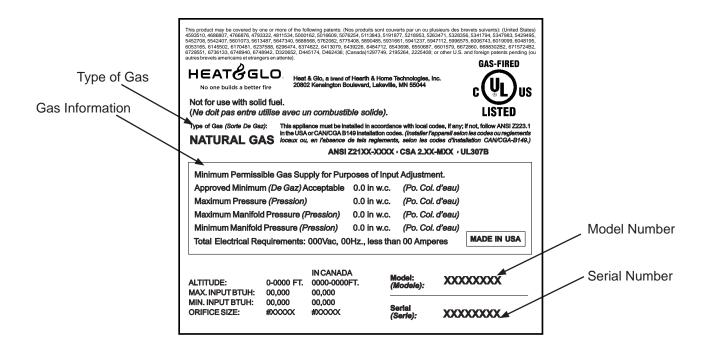


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^{→ =} Contains updated information.

A. Appliance Certification

The information in this manual pertains to Models CFL-18 NG/LP-C, CFL-24 NG/LP-C, CFL-30 NG/LP-C. CFL-24 NG/LP-IPI and ST-CFL-24NG/LP-B.

These gas log sets have been tested and listed in the U.S. in accordance with ANSI Z21.60b-2004. They have been listed by Underwriters Laboratories Inc. for installation and operation in the United States and Canada as described in these Installation and Operation Instructions. All components are UL, AGA, CGA or CSA safety certified.

Check with your local building code agency prior to installing this appliance to ensure compliance with local codes, including the need for permits and follow-up inspections. In the absence of local codes, comply with the National Fuel Gas Code, ANSI Z223.1-Latest Edition in the U.S. If any assistance is required during installation, please contact your local dealer.



A WARNING

Fire Risk Asphyxiation Risk



- This log set must NOT be installed in an unvented appliance.
- Open the chimney damper to its fully open position when burning this gas log set.
- · Logs must never be burned without the flue damper in the full open position. Failure to do so is dangerous to your health and voids all warranties.
- All gas appliances produce some carbon monoxide when operated. Carbon monoxide is a colorless, odorless, poisonous gas. Adequate provisions must be made to provide combustion air for this gas log set. If outside air is not included in the fireplace, it may be necessary that an additional combustion air source be provided.

CAUTION

Check the construction of the fireplace before installing the gas log set. The area of the flue should not be less than 1/11 the area of the fireplace opening. Non-airtight glass doors should be installed on the fireplace if the area of the flue is less than 1/11 the area of the fireplace opening. Airtight doors must never be used with this gas log set.

Gas Log Sets are Decorative Gas Appliances for Installation in a Solid-fuel Burning Fireplace. Minimum fireplace sizes for these models is shown in Figure 1.

This log set is to be installed only in a solid-fuel burning fireplace with a working flue and one constructed of noncombustible material. The minimum permanent vent opening provided by the fireplace chimney damper to vent the flue products must not be less than 51 square inches (328 cm²). The chimney damper MUST be fixed in a manner to maintain the minimum permanent vent opening. This may be accomplished by fastening the damper stop clamp provided to the edge of the damper to prevent its closing.

The installation, including provisions for combustion and ventilation air, must conform with the National Fuel Gas Code ANSI Z223.1 (in the United States), the CAN/CGA B-149 Installation Code (in Canada) and applicable local building codes.

These models can be installed in a bedroom (in the United States) which has a total volume of unconfined space appropriate to the particular installation. Refer to the National Fuel Gas Code ANSI Z223.1/NFPA 54-(current edition). The Uniform Mechanical Code (current edition), and Local Building Officials for the options allowed in obtaining an effective bedroom volume of unconfined space.

Always keep the appliance area clear and free from combustible materials, gasoline, and other flammable vapors and liquids.

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system and any gas control which has been under water.



WARNING



Fire Risk

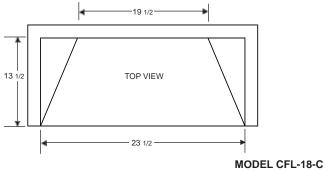
THIS UNIT IS NOT FOR USE WITH SOLID FUEL. Solid fuels shall not be burned in a fireplace where a decorative appliance is installed. Failure to follow these instructions will result in a fire.

B. High Altitude Installation

U.L. Listed gas appliances are tested and approved without requiring changes for elevations from 0 to 2,000 feet in the U.S.A. and in Canada.

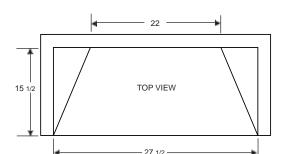
When installing this appliance at an elevation above 2,000 feet, it may be necessary to decrease the input rating by changing the existing burner orifice to a smaller size. Input rate should be reduced by 4% for each 1000 feet above a 2000 foot elevation in the U.S.A. or 10% for elevations between 2000 and 4500 feet in Canada. If the heating value of the gas has been reduced, these rules do not apply. To identify the proper orifice size, check with the local gas utility.

If installing this appliance at an elevation above 4,500 feet (in Canada), check with local authorities.



MINIMUM FIREPLACE SIZE FRONT WIDTH: 23 1/2" (750mm) REAR WIDTH: 19 1/2" (521mm) DEPTH: 13 1/2" (331mm)

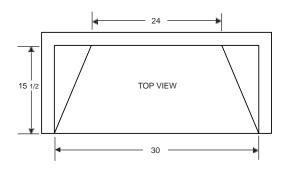
HEIGHT : 22" (508mm)



MINIMUM FIREPLACE SIZE

FRONT WIDTH: 27 1/2" (750mm)
REAR WIDTH: 22" (521mm)
DEPTH: 15 1/2" (331mm)
HEIGHT: 22" (508mm)

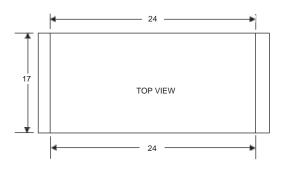
MODEL CFL-24-C



MINIMUM FIREPLACE SIZE

FRONT WIDTH: 30" (750mm)
REAR WIDTH: 24" (521mm)
DEPTH: 15 1/2" (331mm)
HEIGHT: 22" (508mm)

MODEL CFL-30-C



MINIMUM FIREPLACE SIZE

FRONT WIDTH: 24" (521mm)
REAR WIDTH: 24" (521mm)
DEPTH: 17" (331mm)
HEIGHT: 20" (508mm)

MODEL ST-CFL-24-B

Figure 1. Minimum Fireplace Sizes for CFL-18/24/30-C and ST-CFL-24-B

CAUTION

When installing this log set in a factory built fireplace, be certain to consult the fireplace installation manual. <u>ALL</u> knockouts in the fireplace through which the gas supply line is run <u>MUST</u> be resealed with insulation after the gas line is in place.

These models contain complete gas-burner, grate(s), and log components needed. Use caution when handling logs to avoid damage. Position the gas-burner assembly to the rear of the fireplace. The ST-CFL-24 log set should be positioned in the center of the unit. Once fully assembled, the front log will extend forward of the burner assembly.

CAUTION

To minimize the possibility of spillage and to maximize proper draft, position the log set as close to the back of the fireplace as possible. The ST-CFL-24 log set should be positioned in the center of the unit.

A. Installation

- 1. Run proper size gas line into fireplace. A 1/2 inch (13mm) gas line, with a 3/8 inch (10mm) reduction for hook-up, is usually sufficient for the Gas Log set; however, if the run is unusually long, a larger line may be required. Contact your local gas company or Department of Building and Safety if there are any questions.
- 2. Minimum inlet gas supply pressure for purposes of input adjustment, shall be 7.0 inches w.c. (1.75kPa) for natural gas and 11.0 inches w.c. (2.75kPa) for propane (LP gas). Maximum inlet gas supply pressure shall be 14.0 in. w.c. (3.5kPa) for both natural gas and propane (LP gas). Manifold (outlet) pressure should be 3.5 inches w.c. (.87kPa) for natural gas and 10.0 inches w.c. (2.5kPa) for LP gas.
- The appliance and its individual shut off valve must be disconnected from the gas supply piping system during any pressure testing of the system at test pressures in excess of 1/2 psig (3.5kPa).
- 4. This appliance must be isolated from the gas supply piping system by closing its individual manual shut off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psig (3.5kPa).

Note: The gas supply line should be purged of any trapped air prior to the first firing of the unit.

CAUTION

Standing Pilot units only: During the initial purging and subsequent lightings, NEVER allow the gas control valve knob to remain depressed in the "PILOT" position without pushing the ignitor button at least once every second.

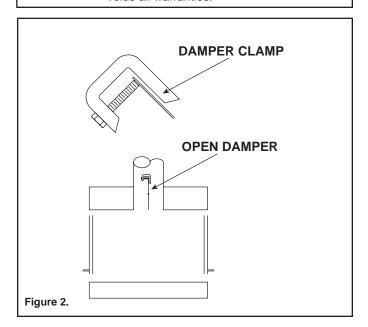
5. A damper stop clamp with set screw is provided to prevent full closure of the fireplace damper blade. Attach the clamp to the edge of the damper blade with pliers or wrenches. If the damper stop supplied does not fit the application, use a permanent means that will keep the damper open to a MINIMUM of 51 square inches (328cm²). See Figure 2.

A WARNING



Fire Risk

- Open the chimney damper to its FULLY OPEN position when burning this gas log set.
- Logs must NEVER be burned without the flue damper in the FULL OPEN position. Failure to do so is dangerous to your health and voids all warranties.



Note: The Commonwealth of Massachusetts requires that the chimney flue damper, when used with gas logs, shall be welded open or completely removed.

- Test fire the unit after referring to the SAFETY INFOR-MATION and LIGHTING INSTRUCTIONS found in Section 3 in this manual, or on the label plate assembly found on the gas-burner.
- After the gas line installation is complete, all connections must be tightened and checked for leaks with a commercially-available, non-corrosive leak check solution. Be sure to rinse off all leak check solution following testing. Refer to Section 3, OPERATING GUIDELINES and MAINTENANCE INSTRUCTIONS.
- Once the gas-burner is test fired and gas supply lines are purged, assemble the grate(s) and logs. Be certain to follow the Log Placement Instructions shipped with the unit. Remember to keep the Log Instructions along with this manual for future use.
- This appliance may be used with a wall switch and/or remote control.
- Use low resistance thermostat wire for wiring from ignition system to the wall switch.
- Keep wire lengths as short as possible by removing any excess wire length.
- Low voltage and 110 VAC voltage cannot be shared within the same wall box.

Note: This appliance must be electrically wired and grounded in accordance with local codes or, in the absence of local codes, with National Electric Code ANSI/NFPA 70-latest edition or the Canadian Electric Code, CSA C221.1.

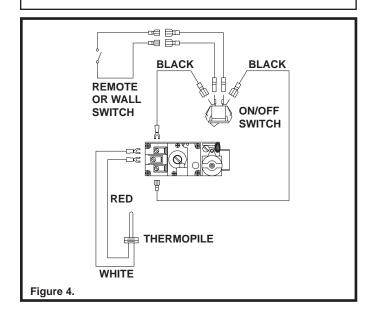
WARNING

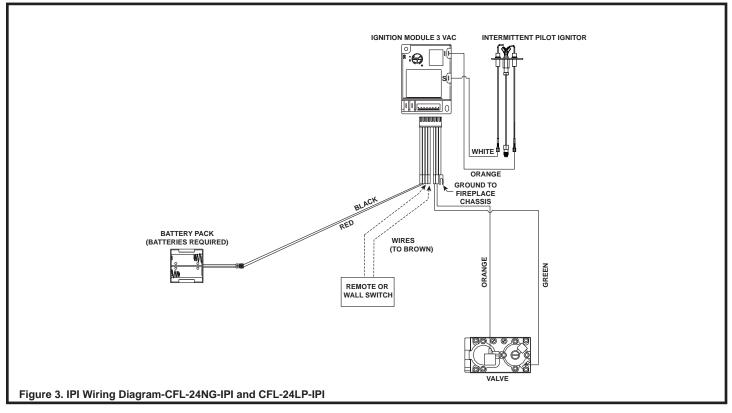


Hearth & Home Technologies disclaims any responsibility for, and the warranty will be voided by, the following actions:

- Installation and use of any damaged appliance or vent system component.
- · Modification of the appliance.
- Installation other than as instructed by Hearth & Home Technologies.
- · Improper positionsing of the gas logs.
- Installation and/or use of any component part not approved by Hearth & Home Technologies.

Any such action may cause a fire hazard.





- If a remote control is used, the receiver cannot be placed under the burner. If possible, place the receiver outside the combustion chamber.
- If the receiver must be placed in the combustion chamber, the protective heat shield MUST be used. See Figure 5.

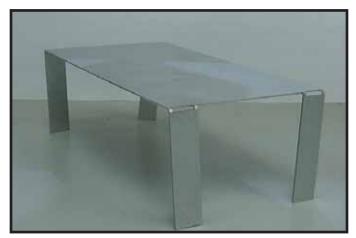


Figure 5. Protective Heat Shield

 Position receiver on left side of gas log set (opposite the pilot). Place protective heat shield over receiver. See Figure 5.



Figure 6. Receiver Location-Left Side of Log Set

Operating Guidelines and Maintenance Instructions

A. Before Lighting Appliance

Before lighting this appliance determine if it has a Standing Pilot or Intellifire ignition system by viewing the wiring system and gas valve. If this appliance has a red or black ignitor button (see Figure 3 and Figure 4) this appliance has a Standing Pilot ignition system. If there is no red or black ignitor button, this appliance has an Intellifire ignition system.



A WARNING

Be sure fireplace screen or glass doors are in place when burning fireplace logs. Unless other provisions for combustion air are provided, the screen or doors shall have an opening for introduction of combustion air. THIS GAS LOG SET IS NOT DESIGNED TO OPERATE WITH AIR TIGHT GLASS DOORS. Adequate combustion and cooling air must be provided or the unit will not function properly.



A WARNING





WARNING: To avoid possible injury, fire and explosion, please read and follow these precautions and all instructions on this appliance before lighting the pilot. This appliance uses L.P. (Propane) gas which is heavier than air and will remain at floor level if there is a leak. Before lighting, smell at floor level and/or use other means (such as using a commercially-available, non-corrosive leak check solution on all piping and connections, using a gas detector, etc.) to check for gas leaks. NOTE: L.P. (Propane) gas can become odorless and CANNOT always be detected by smell.

Before operating this appliance have a qualified technician:

- Remove all shipping materials.
- Review proper placement of logs, rockwool, lava rock, and vermiculite.
- Check the wiring.
- Ensure that there are no gas leaks.

Upon completing the gas line connection, a small amount of air will be in the lines. When first lighting the pilot light, it will take a few minutes for the lines to purge themselves of this air. Once the purging is complete, the pilot and burner will light and operate as indicated in the instruction manual. Subsequent lighting of the appliance will not require such purging.

WARNING

HOT SURFACES!

Glass and other surfaces are hot during operation AND cool down.

Hot glass will cause burns.

- Do not touch glass until it is cooled
- NEVER allow children to touch glass
- Keep children away
- CAREFULLY SUPERVISE children in same room as fireplace.
- Alert children and adults to hazards of high temperatures.

High temperatures may ignite clothing or other flammable materials.

 Keep clothing, furniture, draperies and other flammable materials away.

This appliance has been supplied with an integral barrier to prevent direct contact with the fixed glass panel. Do NOT operate the appliance with the barrier removed.

Contact your dealer or Hearth & Home Technologies if the barrier is not present or help is needed to properly install one.

A WARNING

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to the owner's information manual provided with this appliance. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

A WARNING

Do NOT use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

B. Maintenance

Periodically remove the logs and examine the burner. If dirty, clean with a soft brush. Also examine the area around the burner air shutter and the pilot. Any dirt or lint in this area should be removed. This will ensure long life and trouble-free operation.

The appliance and venting system should be inspected before initial use and inspected and cleaned at least annually by a qualified field service person.

Lighting Instructions (IPI)

The IPI system must be operated with two D-cell batteries.

FOR YOUR SAFETY READ BEFORE LIGHTING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- **A.** This appliance is equipped with an intermittent pilot ignition (IPI) device which automatically lights the burner. **DO NOT** try to light the burner by

 • If you cannot reach your gas suphand
- B. BEFORE LIGHTING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- DO NOT try to light any appliance.
- DO NOT touch any electric switch; do not use any phone in your building.

- · Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
- plier, call the fire department.
- C. DO NOT use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

WARNING:

DO NOT CONNECT 110 VAC TO THE CONTROL VALVE.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to the owner's information manual provided with this appliance.

This appliance needs fresh air for safe operation and must be installed so there are provisions for adequate combustion and ventilation air.

If not installed, operated, and maintained in accordance with the manufacturer's instructions, this product could expose you to substances in fuel or fuel combustion which are known to the State of California to cause cancer, birth defects, or other reproductive harm.

Keep burner and control compartment clean. See installation and operating instructions accompanying appliance.

CAUTION:

Hot while in operation. **DO NOT** touch. Keep children, clothing, furniture, gasoline and other liquids having flammable vapors away.

DO NOT operate the appliance with fixed glass assembly removed, cracked or broken. Replacement of the fixed glass assembly should be done by a licensed or qualified service person.

NOT FOR USE WITH SOLID FUEL

For use with natural gas and propane. A conversion kit, as supplied by the manufacturer, shall be used to convert this appliance to the alternate fuel.

Also Certified for Installation in a Bedroom or a Bedsitting Room.

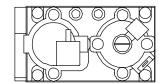
For assistance or additional information, consult a qualified installer, service agency or the gas supplier.

For additional information on operating your Hearth & Home Technologies fireplace, please refer to www.fireplaces.com.

LIGHTING **INSTRUCTIONS** (IPI)

- 1. Turn off all electric power to the appliance.
- 2. This appliance is equipped with an ignition device which automatically lights the burner. **DO NOT** try to light the burner by hand.

GAS VALVE



- 3. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the Safety Information located on the left side of this label. If you do not smell gas, go to next step.
- 4. Turn on all electric power to the appliance.
- 5. To light the burner, flip the ON/OFF switch to the "ON" position. (The ON/OFF switch may include a wall switch if so equipped).
- 6. If the appliance will not operate, follow the instructions "To Turn Off Gas to Appliance" and call your service technician or gas supplier.

TO TURN OFF **GAS TO APPLIANCE**

- 1. Turn wall control or ON/OFF switch to "OFF".
- 2. Turn off all electric power to the appliance if service is to be performed.

593-913F

Final inspection by _

」 FOR YOUR SAFETY └ READ BEFORE LIGHTING

WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- **A.** This appliance has a pilot which must be lighted by hand. When lighting the pilot, follow these instructions exactly.
- **B. BEFORE LIGHTING,** smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any phone in your building.
- Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.

- If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

WARNING:

DO NOT CONNECT 110 VAC TO THE CONTROL VALVE.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to the owner's information manual provided with this appliance.

This appliance needs fresh air for safe operation and must be installed so there are provisions for adequate combustion and ventilation air.

If not installed, operated, and maintained in accordance with the manufacturer's instructions, this product could expose you to substances in fuel or fuel combustion which are known to the State of California to cause cancer, birth defects, or other reproductive harm.

Keep burner and control compartment clean. See installation and operating instructions accompanying appliance.

CAUTION:

Hot while in operation. Do not touch. Keep children, clothing, furniture, gasoline and other liquids having flammable vapors away.

Do not operate the appliance with panel(s) removed, cracked or broken. Replacement of the panel(s) should be done by a licensed or qualified service person.

NOT FOR USE WITH SOLID FUEL

For use with natural gas and propane. A conversion kit, as supplied by the manufacturer, shall be used to convert this appliance to the alternate fuel.

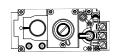
Also Certified for Installation in a Bedroom or a Bedsitting Room.

For assistance or additional information, consult a qualified installer, service agency or the gas supplier.

For additional information on operating your Hearth & Home Technologies fireplace, please refer to www.fireplaces.com.

☐ LIGHTING | INSTRUCTIONS

- 1. Turn off all electric power to the appliance.
- 2. Push in gas control knob slightly and turn clockwise to "OFF".



NOTE: Knob cannot be turned from "PILOT" to "OFF" unless knob is pushed in slightly. Do not force.

- Wait five (5) minutes to clear out any gas.
 Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the Safety Information located on the left side of this label. If you don't smell gas, go to next step.
- Find the pilot. The pilot is inside combustion chamber next to the main burner.



- Turn knob on gas control counter clockwise to "PILOT".
- 6. Push in control knob all the way and hold in. Immediately depress red or black piezo button. It may require several depressions of the red or black piezo button until PILOT lights. If PILOT light does not light after 10 seconds, return to step 3. Continue to hold the control knob in for about one minute after the pilot is lit. Release knob and it will pop back out. Pilot should remain lit. If it goes out, repeat steps 3 through 6.
- If knob does not pop up when released, stop and immediately call your service technician or gas supplier.
- If the pilot will not stay lit after several tries, turn the gas control knob to "OFF" and call your service technician or gas supplier.
- 7. Turn gas control knob counterclockwise to "ON".
- 8. To light Burner, flip the on/off switch to the "ON" position, and close access grille.
- 9. Turn on all electric power to the appliance.

GAS TO APPLIANCE

- Turn off all electric power to the appliance if service is to be performed.
- 2. Open control access panel.
- 3. Move switch to "OFF" position.
- **4.** Push in gas control knob slightly and turn clockwise to OFF". Do not force.
- 5. Close control access panel.



Troubleshooting

With proper installation, operation, and maintenance your gas appliance will provide years of trouble-free service. If you do experience a problem, this troubleshooting guide will assist a qualified service technician in the diagnosis of a problem and the corrective action to be taken. This troubleshooting guide can only be used by a qualified service technician. Contact your dealer to arrange a service call by a qualified service technician.

A. Standing Pilot Ignition System

Symptom	Possible Causes	Corrective Action
After repeated triggering of the red or black piezo ignitor button, the spark	A. No gas or low gas pressure.	Check the remote shut-off valves from the appliance. Usually, there is a valve near the gas main. There can be more than one valve between the appliance and the main.
ignitor will not light the pilot.	B. No lp in tank.	Check the LP (propane) tank. You may be out of fuel.
pilot.	C. Ignitor.	Check the spark at the electrode and pilot. If no spark and electrode wire is properly connected, replace the ignitor. Verify that there is no short in electrode wire.
	D. Pilot or misaligned electrode (spark at electrode).	Using match, light the pilot. If the pilot lights, turn off the pilot and trigger the piezo ignitor button again. If the pilot lights, an improper gas/air mixture caused the bad lighting and a longer purge period is recommended. If the pilot will not light, ensure the gap at the electrode and pilot is one-eighth in. to have a strong spark. If the gap is OK, replace the pilot.
The pilot will not stay lit after carefully following	A. Thermocouple.	Check that the pilot flame impinges on the thermocouple. Adjust the pilot for proper flame impingement.
the lighting instructions.		Ensure that the thermocouple connection at the gas valve is fully inserted and tight (hand tighten plus 1/4 turn).
		Verify proper voltage output from the thermocouple to the valve. Place one millivolt meter lead wire on the thermocouple copper lead. Place the second lead wire on the solder button on the back of the valve (blue wire). Start the pilot and hold the valve knob in. The millivolt reading should read 8-16 millivolts. If millivolt reading is less than 8 millivolts, replace thermocouple.
	B. Improper gas inlet pressure.	Natural gas should be 5-14 in. w.c. LP should be 10-14 in. w.c. Verify pressure with manometer.
	C. Valve.	If the thermocouple is producing 8-16 millivolts, replace control valve.
3. The pilot is burning, there is no burner flame, the valve knob is in the ON position, and the ON/OFF switch is in	A. On/off switch or wires.	Check the ON/OFF switch and wires for proper connections. Place the jumper wires across the terminals at the switch. If the burner comes on, replace the switch. If the switch is OK, place the jumper wires across the switch wires at the gas valve. If the burner comes on, the wires are faulty or connections are bad.
the ON position.	B. Thermopile may not be gen-	Check that the pilot flame impinges thermopile properly.
	erating sufficient millivoltage.	Be sure the wire connections from the thermopile at the gas valve terminals are tight and that the thermopile is fully inserted into the pilot bracket.
		Check the thermopile with a millivolt meter. Take the reading at TH-TP&TP terminals of the gas valve. The meter should read 350 millivolts minimum, while holding the valve knob depressed in the pilot position, with the pilot lit, and the ON/OFF switch in the OFF position. Replace the thermopile if the reading is below the specified minimum.
		With the pilot in the ON position, disconnect the thermopile leads from the valve. Take a reading at the thermopile leads. The reading should be 350 millivolts minimum. Replace the thermopile if the reading is below the minimum.

Troubleshooting (continued)

Symptom	Possible Cause	Corrective Action
3. (Continued)	c. Valve.	Turn the valve knob to the ON position. Place the ON/OFF switch in the ON position. Check the millivolt meter a the thermopile terminals. The millivolt meter should read greater than 125mV. If the reading is acceptable, and if the burner does not come on, replace the gas valve.
	d. Plugged burner orifice.	Check the burner orifice for stoppage. Remove stoppage.
	e. Wall switch or wires.	Follow the corrective action in Symptom and Possible Cause 1.a above. Check the switch and wiring.
Frequent pilot outage problem.	Pilot flame may be too high or too low, or blowing out (high pressure), causing pilot safety to drop out.	Clean thermocouple and adjust the pilot flame for proper flame impingement. Follow lighting instructions carefully.
5. The pilot and main	a. No LP in tank.	Check the LP (propane) tank. Refill the fuel tank.
burner extinguish while in operation.	b. Improper gas inlet pressure.	Verify with manometer. NG should read 5-14 in. w.c. LP should read 10-14 in. w.c.
	c. Inner vent pipe leaking exhaust gases back into the system.	Check venting system for damage. Replace/repair improperly assembled pipe sections.
	d. Glass installed improperly.	Check to ensure glass is installed properly. Replace glass panel assembly.
	e. Thermopile or thermocouple.	Replace pilot if necessary.
	f. Improper vent cap installation.	Check for proper installation and freedom from debris or blockage.
6. Glass soots.	a. Flame impingement.	Adjust the log set so that the flame does not excessively impinge on it. Refer to log instructions.
	b. Improper air shutter setting.	Refer to manual for shutter set points. Ensure that set point is correct for appliance/gas type. If unit has adjustable shutter, it may be necessary to increase shutter opening.
	c. Debris around air shutter.	Inspect the opening at the base of the burner. NO MATERIAL SHOULD BE PLACED IN THIS OPENING.
7. Flame burns blue and lifts off burner.	a. Insufficient oxygen being supplied.	Ensure that the vent cap is installed properly and free of debris. Ensure that the vent system joints are tight and have no leaks.
		Ensure that no debris has been placed at the base of, or in the area of the air holes in the center of the base pan beneath the burner.
		Ensure that the glass is tightened properly on the unit, particularly on top corners.

B. Intellifire Ignition System

Symptom	Possible Cause	Corrective Action	
Pilot won't light. The ignitor/module makes noise, but no	a. Incorrect wiring.	Verify "S" wire (white) for sensor and "I" wire (orange) for ignitor are connected to correct terminals on module and pilot assembly.	
spark.	b. Loose connections or electrical shorts in the wiring.	Verify no loose connections or electrical shorts in wiring from module to pilot assembly. Verify connections underneath pilot assembly are tight; also verify connections are not grounding out to metal chassis, pilot burner, pilot enclosure, mesh screen if present, or any other metal object.	
	c. Ignitor gap is too large.	Verify gap of igniter to right side of pilot hood. The gap should be approximately .17 in. or 1/8 in. (3 mm).	
	d. Module.	Turn ON/OFF rocker switch or wall switch to OFF position. Remove ignitor wire "I" from module. Place a grounded wire about 3/16 in. (9 mm) away from "I" terminal on module. Place ON/OFF rocker switch or wall switch in ON position. If there is no spark at "I" terminal module must be replaced. If there is a spark at "I" terminal, module is fine. Inspect pilot assembly for shorted sparker wire or cracked insulator around electrode. Replace pilot if necessary.	
Pilot won't light, there is no noise or spark.	a. No power.	Check batteries.	
	b. A shorted or loose connection in wiring configuration or wiring harness.	Remove and reinstall the wiring harness that plugs into module. Verify there is a tight fit. Verify pilot assembly wiring to module. Remove and verify continuity of each wire in wiring harness. Replace any damaged components.	
	c. Improper wall switch wiring.	Check wiring connections.	
	d. Module not grounded.	Verify black ground wire from module wire harness is grounded to metal chassis of appliance.	
	e. Module.	Turn ON/OFF rocker switch or wall switch to OFF position. Remove ignitor wire "I" from module. Place ON/OFF rocker switch or wall switch in ON position. If there is no spark at "I" terminal module must be replaced. If there is a spark at "I" terminal, module is fine. Inspect pilot assembly for shorted sparker wire or cracked insulator around electrode.	
3. Pilot sparks, but Pilot will not light.	a. Gas supply.	Verify that incoming gas line ball valve is "open". Verify that inlet pressure reading is within acceptable limits, inlet pressure must not exceed 14 in. W.C.	
	b. Ignitor gap is incorrect.	Verify that spark gap from ignitor to pilot hood is .17 in. or 1/8 in (3 mm).	
	c. Module is not grounded.	Verify module is securely grounded to metal chassis of appliance.	
	d. Module voltage output / Valve/Pilot solenoid ohms readings.	Verify battery voltage is at least 2.7 volts. Replace batteries if voltage is below 2.7.	

Intellifire Ignition System - (continued)

Symptom	Possible Cause	Corrective Action		
4. Pilot lights but continues to spark, and main burner will not ignite. (If the pilot continues to spark after the pilot flame has been lit, flame rectification has not occurred.)	A shorted or loose connection in flame sensing rod.	Verify all connections to wiring diagram in manual. Verify connections underneath pilot assembly are tight. Verify connections are not grounding out to metal chassis, pilot burner, pilot enclosure or screen if present, or any other metal object.		
	b. Poor flame rectification or contaminated flame sensing rod.	With fixed glass assembly in place, verify that flame is engulfing flame sensing rod on left side of pilot hood. Flame sensing rod should glow shortly after ignition. Verify correct pilot orifice is installed and gas inlet is set to pressure specifications. Clean flame sensing rod with emery cloth to remove any contaminants that may have accumulated on flame sensing rod.		
	c. Module is not grounded.	Verify module is securely grounded to metal chassis of appliance. Verify that wire harness is firmly connected to the module.		
	d. Damaged pilot assembly or contaminated flame sensing rod.	Verify that ceramic insulator around the flame sensing rod is not cracked, damaged, or loose. Verify connection from flame sensing rod to white sensor wire. Clean flame sensing rod with emery cloth to remove any contaminants that may have accumulated on flame sensing rod. Verify continuity with a multimeter with ohms set at lowest range. Replace pilot if any damage is detected.		
	e. Module.	Turn ON/OFF rocker switch or wall switch to OFF position. Remove ignitor wire "I" from module. Place ON/OFF rocker switch or wall switch in ON position. If there is no spark at "I" terminal module must be replaced. If there is a spark at "I" terminal, module is fine.		

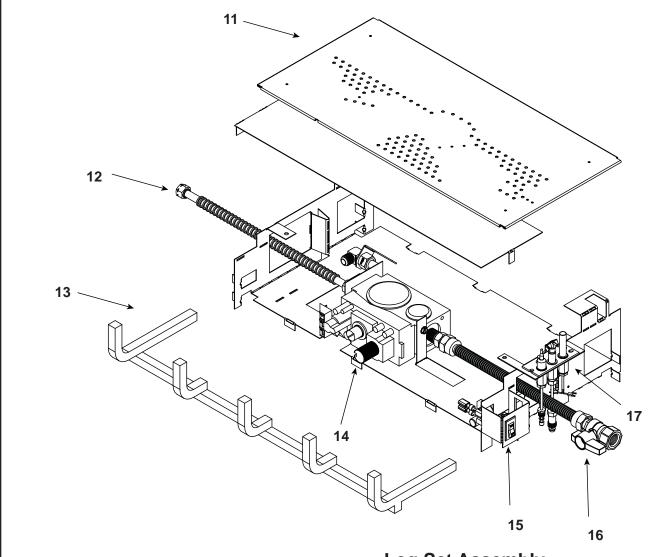
HEAT&GLO A. Service Parts

CFL-18NG-C, CFL-18LP-C

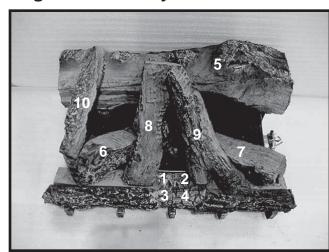
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Service Parts Diagram

Beginning Manufacturing Date: Nov. 2007 Ending Manufacturing Date:



Log Set Assembly



Part number list on following page.

IMPORTANT: THIS IS DATED INFORMATION. When requesting service or replacement parts for your appliance please provide model number and serial number. All parts listed in this manual may be ordered from an authorized dealer.



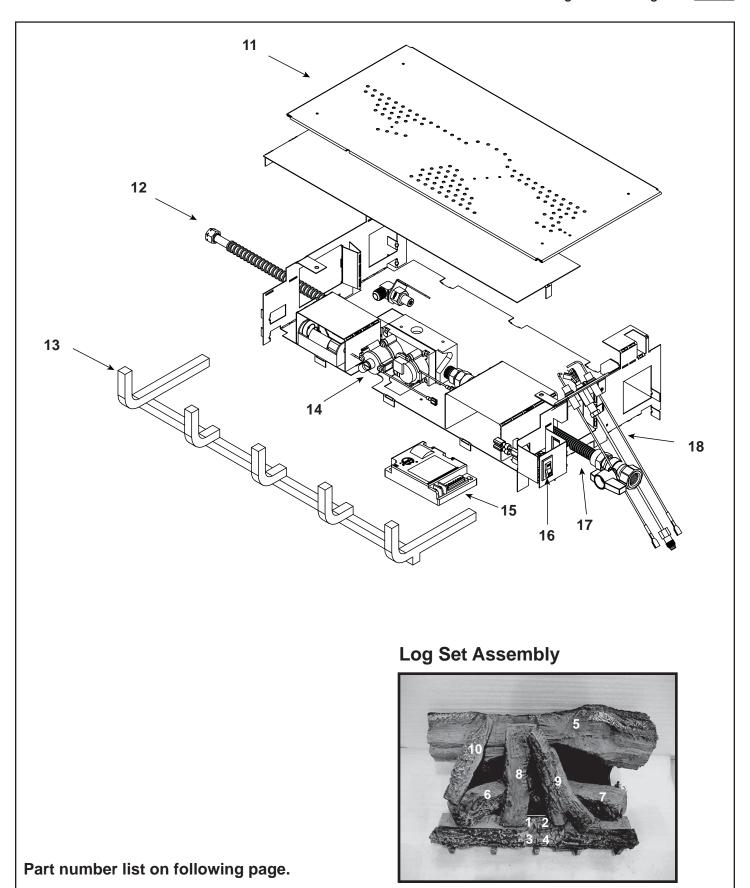
Stocked at Depot

111 11113 11	ianuai may be ordered from an authorized dealer.				
ITEM	DESCRIPTION	COMMENTS	PART NUMBER	at Depot	
1	Log 1		ODV404 700		
2	Log 2		SRV481-766		
3	Log 3		CDV/404 755		
4	Log 4		SRV481-755		
5	Log 5		SRV481-701		
6	Log 6		SRV481-705		
7	Log 7		SRV446-702		
8	Log 8		SRV481-703		
9	Log 9		SRV402-701		
10	Log 10		SRV446-706		
11	Burner Assembly		526-010A	Υ	
12	Flexible Gas Connector		477-301A	Υ	
13	Grate Assembly		526-360		
4.4	Valve NG		418-500	Υ	
14	Valve LP		418-501	Υ	
15	ON/Off Switch		060-521A	Υ	
16	Flex Ball Valve Assembly		302-320A	Υ	
47	Pilot Assembly NG		2103-010	Υ	
17	Pilot Assembly LP		2103-011	Υ	
	Thermocouple		2103-511	Υ	
	Thermopile		2103-512	Υ	
	Pilot Orifice NG		2103-116	Υ	
	Pilot Orifice LP		2103-117	Υ	
	Mineral Wool		050-721		
	Orifice NG (1.55)		526-801	Υ	
	Orifice LP (2.30 mm)		526-800	Υ	
	Piezo Ignitor		291-513	Υ	
	Remote Heat Shield		526-199		
	Vermiculite		060-720		
	Wire Assembly 24 in		089-550A	Υ	
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No one builds a better fire

Beginning Manufacturing Date: June 2008 Ending Manufacturing Date: _____



IMPORTANT: THIS IS DATED INFORMATION. When requesting service or replacement parts for your appliance please provide model number and serial number. All parts listed in this manual may be ordered from an authorized dealer.

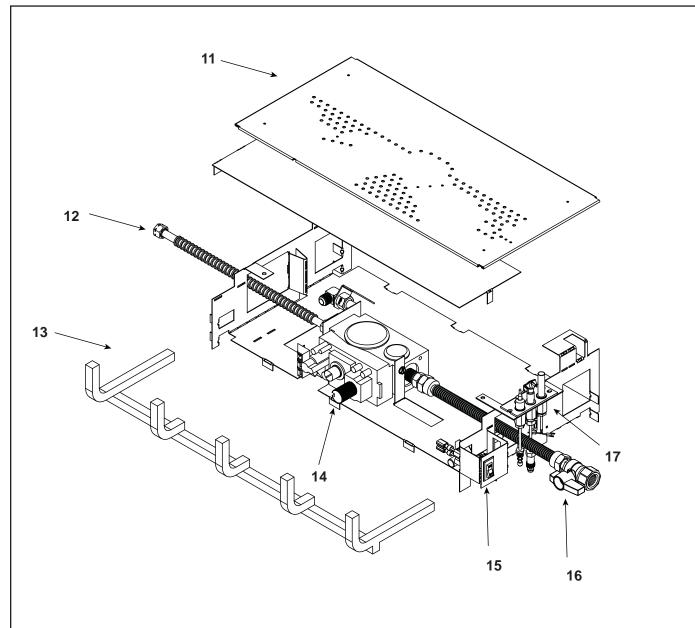


				at Depot
ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
1	Log 1		CDV/494 766	
2	Log 2		SRV481-766	
3	Log 3		SRV481-755	
4	Log 4		3KV401-755	
5	Log 5		SRV526-701	
6	Log 6		SRV481-705	
7	Log 7		SRV446-702	
8	Log 8		SRV481-703	
9	Log 9		SRV402-701	
10	Log 10		SRV446-706	
11	Burner Assembly		526-010A	Y
12	Flexible Gas Connector		477-301A	Υ
13	Grate Assembly		526-360	
4.4	Valve NG		593-500	Υ
14	Valve LP		593-501	Υ
15	Control Module		593-592	Υ
16	ON/Off Switch		060-521A	Υ
17	Flex Ball Valve Assembly		302-320A	Υ
4.0			2090-012	Υ
18	Pilot Assembly LP		2090-013	Υ
	Pilot Orifice NG		593-528	Υ
	Pilot Orifice LP		593-527	Υ
	Battery Pack		593-594A	Υ
	Mineral Wool		050-721	
	Module Heat Shield		526-198	
	Orifice NG (1.55)		526-801	Υ
	Orifice LP (2.30 mm)		526-800	Y
	Remote Heat Shield		526-199	
	Vermiculite		060-720	
	Wire Assembly		593-590A	Υ
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Service Parts Diagram

Beginning Manufacturing Date: Nov. 2007 Ending Manufacturing Date: _____



Log Set Assembly



Part number list on following page.

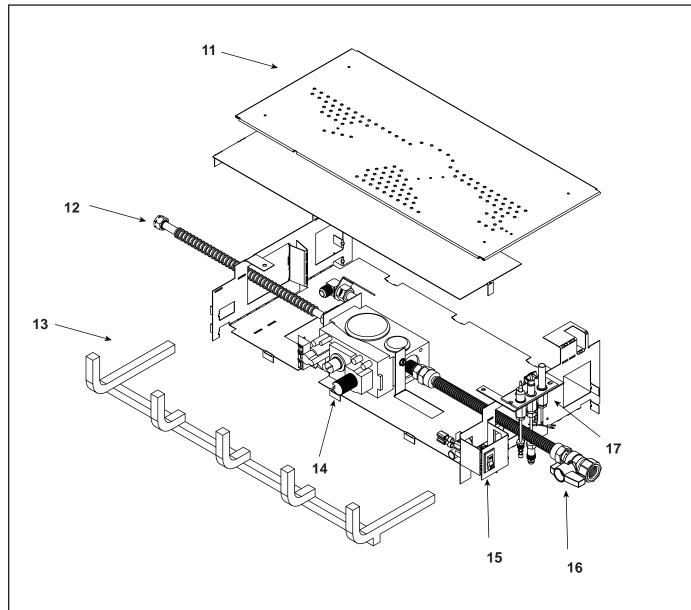
IMPORTANT: THIS IS DATED INFORMATION. When requesting service or replacement parts for your appliance please provide model number and serial number. All parts listed in this manual may be ordered from an authorized dealer.



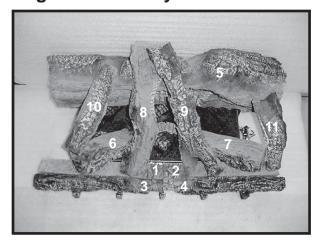
Log 1 Log 2	COMMENTS	PART NUMBER	at Depot
Log 2		CDV/404 700	
209 2		SRV481-766	
Log 3		CDV/404 755	
Log 4		SRV481-755	
Log 5		SRV526-701	
Log 6		SRV481-705	
Log 7		SRV446-702	
Log 8		SRV481-703	
Log 9		SRV402-701	
Log 10		SRV446-706	
Burner Assembly		526-010A	Υ
Flexible Gas Connector		477-301A	Υ
Grate Assembly		526-360	
Valve NG		418-500	Υ
Valve LP		418-501	Υ
ON/Off Switch		060-521A	Υ
Flex Ball Valve Assembly		302-320A	Υ
Pilot Assembly NG		2103-010	Υ
Pilot Assembly LP		2103-011	Υ
Thermocouple		2103-511	Υ
Thermopile		2103-512	Υ
Pilot Orifice NG		2103-116	Υ
Pilot Orifice LP		2103-117	Y
Mineral Wool		050-721	
			Υ
		+	Y
,			Y
-		+	-
			Υ
7,100,000,000,000,000,000,000,000,000,00		000 00071	
	Log 6 Log 7 Log 8 Log 9 Log 10 Burner Assembly Flexible Gas Connector Grate Assembly Valve NG Valve LP ON/Off Switch Flex Ball Valve Assembly Pilot Assembly LP Thermocouple Thermopile Pilot Orifice NG	Log 6 Log 7 Log 8 Log 9 Log 10 Burner Assembly Flexible Gas Connector Grate Assembly Valve NG Valve LP ON/Off Switch Flex Ball Valve Assembly Pilot Assembly NG Pilot Assembly LP Thermocouple Thermopile Pilot Orifice NG Pilot Orifice LP Mineral Wool Orifice NG (1.55) Orifice LP (2.30 mm) Piezo Ignitor Remote Heat Shield Vermiculite	Log 6 SRV481-705 Log 7 SRV446-702 Log 8 SRV481-703 Log 9 SRV402-701 Log 10 SRV446-706 Burner Assembly 526-010A Flexible Gas Connector 477-301A Grate Assembly 526-360 Valve NG 418-500 Valve LP 418-501 ON/Off Switch 060-521A Flex Ball Valve Assembly 302-320A Pilot Assembly NG 2103-010 Pilot Assembly LP 2103-011 Thermocouple 2103-511 Thermopile 2103-512 Pilot Orifice NG 2103-116 Pilot Orifice LP 2103-117 Mineral Wool 050-721 Orifice NG (1.55) 526-801 Orifice LP (2.30 mm) 526-800 Piezo Ignitor 291-513 Remote Heat Shield 526-199 Vermiculite 060-720

No one builds a better fire Service Parts Diagram

Beginning Manufacturing Date: Nov. 2007 Ending Manufacturing Date: _____



Log Set Assembly



Part number list on following page.

IMPORTANT: THIS IS DATED INFORMATION. When requesting service or replacement parts for your appliance please provide model number and serial number. All parts listed in this manual may be ordered from an authorized dealer.

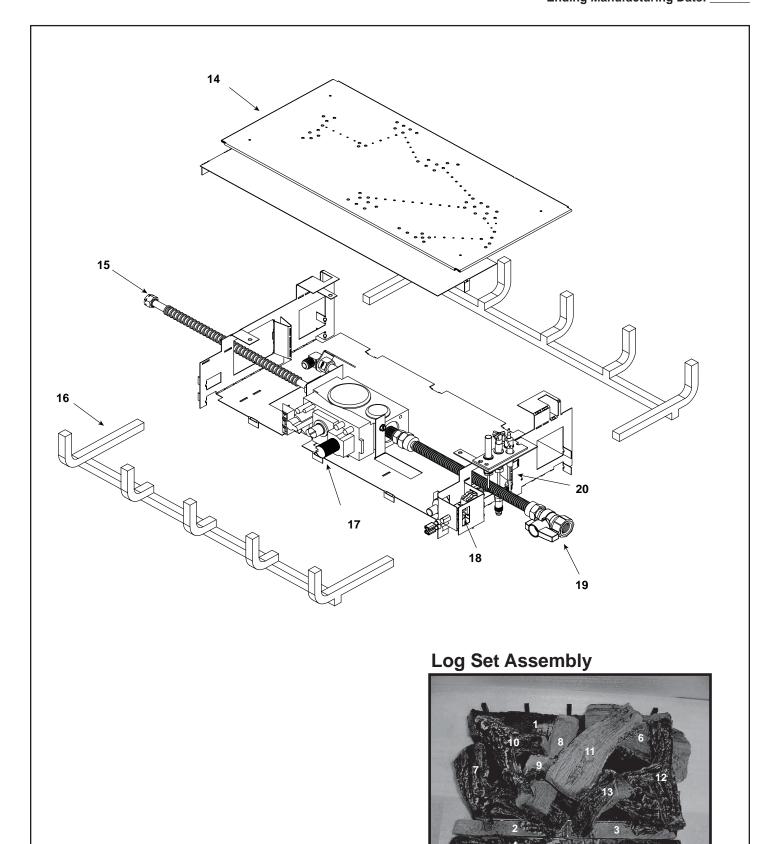


in this m	nual may be ordered from an authorized dealer.			
ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
1	Log 1		SRV526-766	
2	Log 2		3KV320-700	
3	Log 3		SRV526-755	
4	Log 4		3KV320-733	
5	Log 5		SRV526-701	
6	Log 6		SRV481-705	
7	Log 7		SRV446-702	
8	Log 8		SRV481-704	
9	Log 9		SRV446-705	
10	Log 10		SRV446-706	
11	Log 11		SRV530-703	
12	Burner Assembly		526-010A	Υ
13	Flexible Gas Connector		477-301A	Υ
14	Grate Assembly		526-360	
4.5	Valve NG		418-500	Υ
15	Valve LP		418-501	Υ
16	ON/Off Switch		060-521A	Υ
17	Flex Ball Valve Assembly		302-320A	Υ
40	Pilot Assembly NG		2103-010	Υ
18	Pilot Assembly LP		2103-011	Υ
	Thermocouple		2103-511	Υ
	Thermopile		2103-512	Υ
	Pilot Orifice NG		2103-116	Υ
	Pilot Orifice LP		2103-117	Υ
	Mineral Wool		050-721	
	Orifice NG (1.55)		526-801	Υ
	Orifice LP (2.30 mm)		526-800	Υ
	Piezo Ignitor		291-513	Υ
	Remote Heat Shield		526-199	
	Vermiculite		060-720	
	Wire Assembly 24 in		089-550A	Υ
	•			
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Service Parts Diagram

Beginning Manufacturing Date: Nov. 2007 Ending Manufacturing Date: _____



Part number list on following page.

ST-CFL-24NG-B, ST-CFL-24LP-B

IMPORTANT: THIS IS DATED INFORMATION. When requesting service or replacement parts for your appliance please provide model number and serial number. All parts listed in this manual may be ordered from an authorized dealer.



ın tnıs m	nual may be ordered from an authorized dealer.			
ITEM	DESCRIPTION	COMMENTS	PART NUMBER	
1	Log 1		SRV569-710	
2	Log 2		SRV569-711	
3	Log 3		3RV309-711	
4	Log 4		SRV482-755	
5	Log 5		3KV40Z-755	
6	Log 6		SRV569-708	
7	Log 7		SRV569-709	
8	Log 8		SRV569-704	
9	Log 9		SRV569-706	
10	Log 10		SRV569-707	
11	Log 11		SRV569-702	
12	Log 12		SRV569-703	
13	Log 13		SRV569-705	
14	Burner Assembly		526-011A	Υ
15	Flexible Gas Connector		477-301A	Υ
16	Grate Assembly		526-360	
47	Valve NG		418-500	Υ
17	Valve LP		418-501	Υ
18	ON/Off Switch		060-521A	Υ
19	Flex Ball Valve Assembly		302-320A	Υ
00	Pilot Assembly NG		2103-010	Υ
20	Pilot Assembly LP		2103-011	Υ
	Thermocouple		2103-511	Υ
	Thermopile		2103-512	Υ
	Pilot Orifice NG		2103-116	Υ
	Pilot Orifice LP		2103-117	Υ
	Mineral Wool		050-721	
	Orifice NG (1.55)		526-801	Υ
	Orifice LP (2.30 mm)		526-800	Υ
	Piezo Ignitor		291-513	Υ
	Remote Heat Shield		526-199	
	Vermiculite		060-720	
	Wire Assembly 24 in		089-550A	Υ
			•	

→ B. Limited Lifetime Warranty

Hearth & Home Technologies LIMITED WARRANTY

Hearth & Home Technologies ("HHT") and its respective brands extends the following warranty for HHT gas, wood, pellet and electric appliances purchased from an authorized HHT dealer and installed in the United States of America or Canada. Warranty starts with date of purchase by the original owner (End User) except as noted for replacement parts.

Warrant	/arranty Period HHT Manufactured Appliances and Venting								
Parts	Labor	Gas	Wood	Pellet	EPA Wood	Electric	Venting	Components Covered	
1 Year		Х	Х	Х	X	Х	X	All Parts and Material Except as covered by Conditions, Exclusion, and Limitations listed	
2.44				Х	Х			Igniters, Electronic Components, and Glass	
2 ye	ears	Χ	Х	Х	Х			Blowers	
			Х					Molded Refractory Panels	
3 ye	ears			Х				Firepots	
_	_				Ι		<u> </u>		
5 years	3 years			Х	X			Castings & Baffles	
								Firehan IIII Ohimaan	
7 years	3 years		X	Х	×			Firebox, HHT Chimney, Termination & Heat Exchanger	
10 years	1 year	Х						Burners, Logs & Refractory	
Limited Lifetime	1 year	Х						Firebox & Heat Exchanger	
90 🛭	Days	X	Х	Х	Х	Х	Х	All Replacement Parts	
	See Conditions, Exclusions, and limitations. 9-01-08								

CONDITIONS, EXCLUSIONS & LIMITATION OF LIABILITY

- This warranty applies to the original owner and is transferable up to two years from date of purchase to the new homeowner, provided the purchase was made through an authorized dealer or distributor of HHT, and the appliance remains in its original place of installation.
- The maximum amount recoverable under this warranty is limited to the purchase price of the product.
- In no event shall HHT be liable for any incidental or consequential damages caused by defects in the product.
- Adjustments, regular maintenance, cleaning and temporary repairs, or the failure to duplicate the problem in the home is not covered under this warranty.

B. Limited Lifetime Warranty (continued)

- This limited warranty does not extend to or include surface finish on the appliance or terminations, door gasketing, glass
 gasketing, glass discoloration, firebrick, pellet logs, kaowool or other ceramic insulating materials. Rust and/or corrosion
 on any of the metal surfaces, cast iron components, baffles, firepots, doors, or firebox area are not covered by this
 warranty.
- Noise resulting from minor expansion, contraction, or movement of certain parts is normal and complaints related to this
 noise are not covered by this warranty.
- HHT's obligation under this warranty does not extend to damages resulting from: (1) installation, operation or maintenance of the appliance not in accordance with the installation instructions; operating instructions and the listing agent identification label furnished with the appliance; (2) installation which does not comply with local building codes; (3) shipping, improper handling, improper operation, abuse, misuse, accident or unworkmanlike repairs; (4) environmental conditions, inadequate ventilation or drafting caused by tight sealing construction of the structure or handling devices such as exhaust fans or forced air furnaces or other such causes; (5) use of fuels other than those specified in the operating instructions; (6) installation or use of components not supplied with the appliance or any other components not expressly authorized and approved by HHT; and/or (7) modification of the appliance not expressly authorized and approved by HHT in writing.
- This warranty does not apply to non-HHT venting components, hearth components or other accessories used in conjunction with the installation of this product.
- This warranty is void if the appliance has been over-fired or operated in atmospheres contaminated by chlorine, fluorine, or other damaging chemicals the appliance is subject to prolonged periods of dampness or condensation, or there is any damage to the appliance or other components due to water or weather damage which is the result of, but not limited to, improper chimney or venting installation.
- HHT's liability under this warranty is limited to the replacement and repair of defective components or workmanship during
 the applicable period. HHT may fully discharge all of its obligations under such warranties by repairing the defective
 component(s) at HHT's discretion. Shipping costs are not covered under this warranty.
- Some states do not allow exclusions or limitation of incidental or consequential damages, so those limitations may not apply to you. This warranty gives you specific rights; you may also have other rights, which vary from state to state.
- EXCEPT TO THE EXTENT PROVIDED BY LAW, HHT MAKES NO EXPRESS WARRANTIES OTHER THAN THE WARRANTY SPECIFIED HEREIN. THE DURATION OF ANY IMPLIED WARRANTY IS LIMITED TO DURATION OF THE WARRANTY SPECIFIED ABOVE.

This Limited Warranty is effective on all HHT appliances sold after September 01, 2008 and supersedes any and all warranties currently in existence.

If warranty service is needed, you should contact your installing dealer. If the installing dealer is unable to provide necessary parts or components, contact the nearest authorized HHT dealer or supplier.

Page 2 of 2 4021-645A 09-01-08

C. Contact Information



No one builds a better fire

Heat & Glo, a brand of Hearth & Home Technologies Inc. 20802 Kensington Boulevard, Lakeville, MN 55044 www.heatnglo.com

Please contact your Heat & Glo dealer with any questions or concerns.

For the location of your nearest Heat & Glo dealer,

please visit www.heatnglo.com.

- NOTES -

CAUTION

DO NOT DISCARD THIS MANUAL

Important operating and maintenance instructions included.

- Read, understand and follow these instructions for safe installation and operation.
- Leave this manual with party responsible for use and operation.



This product may be covered by one or more of the following patents: (United States) 4593510, 4686807, 4766876, 4793322, 4811534, 5000162, 5016609, 5076254, 5113843, 5191877, 5218953, 5263471, 5328356, 5341794, 5347983, 5429495, 5452708, 5542407, 5601073, 5613487, 5647340, 5688568, 5762062, 5775408, 5890485, 5931661, 5941237, 5947112, 5996575, 6006743, 6019099, 6048195, 6053165, 6145502, 6170481, 6237588, 6296474, 6374822, 6413079, 6439226, 6484712, 6543698, 6550687, 6601579, 6672860, 6688302B2, 6715724B2, 6729551, 6736133, 6748942, 6769426, 6774802, 6796302, 6840261, 6846441, 6863064, 6866205, 6869278, 6875012, 6880275, 6908039, 6919884, D320652, D445174, D462436; (Canada) 1297749, 2195264, 2225408, 2313972; (Australia) 780250, 780403, 1418504 or other U.S. and foreign patents pending.

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